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NUMBER THEORY AND DIOPHANTINE ANALYSIS.

164. Proposed by G. J. GRIFFITHS, M. A., in Educational Times (Unsolved).

Prove that the sum of the squares of the reciprocals of all integers which are not divisible by the square of any prime is $15/\pi^2$.

Solution by G. B. M. ZERR, A. M., Ph. D., Philadelphia, Pa., and V. M. SPUNAR, Pittsburg, Pa.

A solution of this problem is found on page 211, Vol. XIII, No. 11. Also page 134, Vol. V, No. 5.

The required sum is

$$S=\left(1+\frac{1}{2^2}\right)\left(1+\frac{1}{3^2}\right)\left(1+\frac{1}{5^2}\right)\left(1+\frac{1}{7^2}\right)\ldots$$

$$=\frac{\left(1-\frac{1}{2^4}\right)\left(1-\frac{1}{3^4}\right)\left(1-\frac{1}{5^4}\right)\left(1-\frac{1}{7^4}\right)\ldots}{\left(1-\frac{1}{2^2}\right)\left(1-\frac{1}{3^2}\right)\left(1-\frac{1}{5^2}\right)\left(1-\frac{1}{7^2}\right)\ldots}$$

$$1/\left(1-\frac{1}{2^4}\right)\left(1-\frac{1}{3^4}\right)\left(1-\frac{1}{5^4}\right)\ldots=\frac{1}{1^4}+\frac{1}{2^4}+\frac{1}{3^4}+\frac{1}{4^4}+\ldots=\frac{\pi^4}{90}=\sigma_1.$$

$$1/\left(1-\frac{1}{2^2}\right)\left(1-\frac{1}{3^2}\right)\left(1-\frac{1}{5^2}\right)\ldots=\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+\frac{1}{4^2}+\ldots=\frac{\pi^2}{6}=\sigma.$$

$$S=\frac{\sigma}{\sigma_1}=\frac{\pi^2}{6}/\frac{\pi^4}{90}=\frac{15}{\pi^2}.$$

Also solved by S. Lefsehetz.

165. Proposed by J. EDWARD SANDERS, Weather Bureau, Chicago, Ill.

Factor (if possible), 11, 111, 111, 111.

Solution by the PROPOSER.

The prime factors of 11, 111, 111, 111 are 21649 and 513239. The best method known to me to find them, is to make an extended table of numbers of the form $22n+1$ and after striking out the composite ones use the remaining numbers as trial factors. The table may be extended as required but in any case need not be carried beyond 25000.